

different locations. The LTS, furthermore, should be set up to operate 5 days a week with sufficient down time for forced and unforced outages, while still treating the required amount of leachate.

7.2 HWMF and E-22R Area Evaluations

In order to establish such a long term plan, and to be prepared for the event that the Medium Term Extraction Plan needs improving as leachate levels decline, WCL proposes to continue the extraction system performance evaluations as well as conduct additional hydrogeologic evaluations of the HWMF/E-22R Area. The scope of each of these is discussed below. As more data becomes available the scope of these evaluations will be modified as necessary in consultation with DTSC.

7.2.1 Extraction System Performance Evaluations

The process of systematically evaluating the extraction system performance will be continued. It includes the following key field observations:

- Weekly extraction volume measurements from individual operating wells.
- Bi-weekly piezometer readings and monthly readings from those wells that serve both as extraction wells and piezometers, as these require pumping to be shut off for a period of a few days.
- Monthly performance evaluations which include comparing the volume of leachate extracted from each HWMF Zone, E-22R Area, and around the HWMF and E-22R Area perimeter, the extent of inward gradient achieved, and the rate at which the perimeter gradients are improving (i.e. becoming inward) with time.
- Recommendations as necessary of any further modifications to the extraction system.

The criteria that will be used to make recommendations for changes or additions to the extraction system in the medium term will be similar to those used above in Section 3.0. Well improvements or additional wells will be required when:

- The volume of leachate extracted from a particular zone of the HWMF and the E-22R Area is considered to be too low,
- There is no established inward gradient, or
- The rate of change of the gradient is very slow or is not occurring.

A recommendation for continued extraction will occur when wells are efficient and achieve very significant draw downs, although it is likely that over time the volume of leachate removed will lessen as leachate levels decline over time. In addition, when a sufficient inward gradient has been established, a recommendation will be made to reduce pumping to levels that maintain such a gradient.

7.2.2 Hydrogeologic Evaluations

These evaluations will include continued refinement of the conceptual model of the HWMF and E-22R Area, assessment of the radii of influence of wells in the different zones, and further characterization of the leachate quality and the distribution of LNAPL within the HWMF.

Additional field data that will be collected to undertake these evaluations includes:

- Monthly level measurements in all wells that are not monitored as part of the routine operations.
- Quarterly leachate samples and analyses for primary COC's from selected extraction wells in each zone for a period of one year.
- Evaluation of non-intrusive/geophysical survey methods to further refine our understanding of the subsurface.

Additional information that will be collected and evaluated includes:

- Anecdotal, aerial photo, and other information on the distribution of the various waste types with the HWMF and E-22R Area.
- The as-built information on the temporary clay and permanent RCRA cap over the HWMF and E-22R Area and the details of how these tie into the slurry wall.
- The as-built and design information on the slurry wall surrounding the HWMF and E-22R Area.

The above data, coupled with the available information and the routinely collected data will be used to assemble:

- East-west and north-south cross sections through the perimeter of the landfill.
- To the extent possible, a summary of the hydrogeologic characteristics of the different zones and areas within the HWMF/E-22R Area, and the surrounding natural formations including the slurry wall, the barrier wall constructed in the 1970's, and the caps. The characteristics will include leachate storage coefficients and hydraulic conductivities.
- A HWMF/E-22R Area leachate mass balance, including estimates of contained leachate at different elevations, upward migration of groundwater into the landfill and the E-22R Area and slurry wall leachate or groundwater migration rates for different leachate levels and gradients.
- Landfill leachate characteristics. Broad categories of leachate chemistry will be established based on the treatment unit processes required before the leachate can be discharged. Examples include leachate requiring different combinations of treatment for LNAPL, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) as necessary. The leachate categories will be indicated on a plan view of the HWMF/E-22R Area.

Evaluations will include well extraction and zone of influence calculations to determine the optimum number and location of wells to maintain the hydraulic gradients in the long term, and the use of these calculations to select additional wells for Stage 3 analysis to provide for continued recovery in the event any one of the extraction wells became inoperative. Well cycling will also be evaluated to determine over what periods the wells need to be operated in order to maintain gradient control. Finally, the leachate quality evaluations will be used to assess which wells, if any, can be grouped and connected by separate LNAPL conveyance pipelines to the LTS.

In the past, 3-D modeling was conducted (EMCON 1996). Evaluations performed with the model at that time indicated that more extraction wells may be needed to achieve hydraulic gradient control because of the relatively small radius of influence of extraction wells predicted by the model. This modeling will be updated as necessary to account for additional data collected since model inception, and new data generated during extraction well development and pumping.

The actual well performance on the landfill illustrates that its properties vary significantly depending on location, and that while some wells have a limited radius of influence as they are located in low permeability areas, others have relatively large radii of influence,

up to several hundred feet. These wells with large radii of influence are located in the E-22R Area which contains, amongst other wastes, roof shingles which constitute a relatively permeable matrix, and extraction wells located on the west and northeast sides of the Landfill.

The results of the above evaluations will be used to determine the necessary leachate levels in the landfill in order to maintain inward gradients. The criterion nominated by DTSC is a 2-foot inward hydraulic head difference into the HWMF and E22-R Area. However, in the future, both the natural groundwater levels outside of the HWMF and E-22R Area and the leachate levels within the adjacent Class II Landfill will change and fluctuate depending on weather conditions. Therefore, it would be more effective to establish target leachate levels that will accommodate a range of outside leachate or groundwater levels.

The past data and observations prepared during previous HWMF work activities to establish the potential seasonal and year to year fluctuations in these levels, will be reevaluated to estimate future leachate and groundwater levels surrounding the HWMF and E-22R Area. Those levels in turn, will be used to determine the necessary leachate levels with the HWMF and E-22R Area to maintain an inward gradient. These analyses will be supported by calculations of the potential leachate or groundwater migration rates through the surrounding slurry wall and clay cap. Based on these analyses target leachate levels will be set for the piezometers within the HWMF and E-22R Area.

7.3 Final Extraction Well Field Design

Based on the results of the above evaluations, as part of Stage 3 work, a final extraction well field will be designed. The design will identify what additional wells, if any, need to be constructed including construction details such as depth and screened interval, which existing wells need to be replaced, and which wells are to be considered standby wells. Groups of wells with similar water quality will be identified and the design of the conveyance piping will be modified if necessary to allow these groups to be separately conveyed to the LTS. As necessary design and/or specification refinements will be made for the well pumps and well controls and data recording systems to facilitate long-term routine operation.

The monitoring system will also be re-evaluated and changes made as appropriate. The extent of monitoring required will also depend on the objectives and scope of the long term pumping plan as described in Section 7.5 below.

7.4 Final Conveyance System Design

The proposed conveyance piping system contemplates the potential installation of additional wells in either the HWMF or E-22R Area. The details for well heads and low/high point stations shown for the current wells would be the same for additional wells and piping. As much as possible, the current design will anticipate where additional wells and tie-ins may occur and appropriate block valves and tees will be constructed allowing future construction to be completed without interruption of the existing system.

The monitoring systems and control panels will be installed with sufficient conduits and cabling to accommodate potential future wells.

7.5 Long Term Pumping Plan Development

In conjunction with the above evaluation of well design programs, a long term pumping plan will be developed. It will provide the schedule for pumping each extraction well, and provide criteria for the amount of leachate to be removed and the maximum allowable down-time. The plan will also detail when additional wells should be utilized, what piezometer monitoring should be undertaken, and what the threshold leachate levels are to maintain the necessary inward gradients.

7.6 Reporting

The results of the above evaluations will be documented for DTSC review in a report titled: "Long Term Leachate Extraction and Control Plan for the WCCSL Hazardous Waste Management Landfill and E-22R Area". It will include sections on:

- Purpose and Scope
- HWMF/E-22R Conceptual Model
- Extraction Well Performance and Hydrogeologic Evaluations
- Well Field Design and Operational Evaluations
- Long Term (Stage 3) Well Field
 - Design

- Specifications
 - Installation
 - Operation
 - Monitoring
- Conveyance System
 - Design Changes
 - Specifications
- Operational Requirements
- Monitoring Requirements
- Maintenance Requirements
- Reporting
- Plan Reviews and Updates

8.0 SCHEDULE UPDATE

8.1 Introduction

This section summarizes the schedule for completing the above work and also what changes are recommended to the new LTS design and construction schedule. The revised schedule is summarized in Figure 9, and replaces the current schedule provided in the original March 10, 2006, Work Plan. Please note that the duration of activities provided in Figure 9 are in calendar days.

The major changes in schedule include the provision for a three staged approach (i.e. Stages 2 and 3 as defined in Section 1.1 above) to installing and operating new extraction wells and conveyance systems, and an the addition of a design review and modification step to the New LTS construction and operations. This design review and modification step will ensure the new LTS is built in accordance with the March 10, 2006, Work Plan schedule, while at the same time the design is optimized for long term operations.

The staged approach to the well and conveyance system design and construction is needed because it is necessary to make use of the coming summer months to expand the extraction and conveyance systems, even though it is recognized there is currently insufficient data and analysis to predict with accuracy what the long term extraction plans and well configurations may be.

The additional design review and modification step for the New LTS will allow the design and operations to be adjusted to the Long Term Pumping Plan which will be based on substantially more operational and hydrogeologic data than is currently available.

8.2 New Well Installation

As show in Figure 9, the Medium Term (Stage 2) new extraction wells will be installed by early August 2006. These wells will then be connected to the new conveyance piping system before the end of August.

It is expected that approvals for the extraction well program can be obtained by the end of May 2006. The decisions on which of the contingency wells to install will be made at that time.

8.3 Replacement of Conveyance Pipelines

Preliminary designs are incorporated with this Work Plan and are intended for use in obtaining the necessary permit modifications and approvals. Construction drawings are planned for completion by the end of May 2006, and completion of pipeline installation work is anticipated by the beginning of September 2006 (Figure 9).

8.4 Hydrogeologic Evaluations and Long Term Plan

The hydrogeologic evaluations, that will form the basis for establishing the Long Term Pumping Plan, will continue through early November. By that time, 5 to 6 months of well operational data under the higher extraction rates will have been collected.

Upon completion of this well field design, the Long Term Pumping Plan will be completed by the end of November, and will be followed by completion of the planning report at the end of January 2007. The data used to establish this plan will also provide input to the design review and modifications to the new LTS.

8.5 Overall Program Schedule Update

The current schedule results in the following key construction and operational time frames.

Construction of:

- New medium term wells and conveyance pipelines by early September 2006
- Additional Long Term wells and conveyance lines by end July 2007
- Upgraded LTS by mid July 2006
- New LTS by early June 2007
- New LTS Modifications (If any) by end November 2007